



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/644,685	08/20/2003	Trung T. Doan	2269-3414.7US (97-1039.07)	6457
24247	7590	01/10/2005	EXAMINER NADAV, ORI	
TRASK BRITT P.O. BOX 2550 SALT LAKE CITY, UT 84110			ART UNIT 2811	PAPER NUMBER

DATE MAILED: 01/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/644,685

Applicant(s)

DOAN ET AL

Examiner

ori nadav

Art Unit

2811

– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 October 2004.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-72 is/are pending in the application.
- 4a) Of the above claim(s) 11, 19, 20, 29, 38-55, 62, 71 and 72 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10, 12-18, 21-28, 30-37, 56-61 and 63-70 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-10, 12-18, 21-28, 30-37, 56-61 and 63-70, are rejected under 35 U.S.C. 103(a) as being unpatentable over McCollum (5,057,451) in view of Ovshinsky et al. (5,296,716).

McCollum teaches in figure 1c and related text an integrated circuit device comprising:
a first conductive layer 12 including at least one protrusion;
an insulative layer 14 overlying the first conductive layer and exposing at least part of the at least one protrusion, and
a programmable resistive material 16 in direct contact with said at least one protrusion of said first conductive layer,

wherein the exposed part of the at least one protrusion comprises a smaller cross-sectional area than a remaining part of the at least one protrusion of said at least one conductive layer,
a second conductive layer 28 above the programmable resistive material,

Art Unit: 2811

MaCollum does not teach a programmable resistive material comprises a chalcogenide material that is formulated to be reversibly cycled and thus capable of switching between at least two different resistive states.

Ovshinsky et al. teach in figure 1 and related text a programmable resistive material 36 comprises a chalcogenide material that is formulated to be reversibly cycled and thus capable of switching between at least two different resistive states. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a programmable resistive material comprises a chalcogenide material that is formulated to be reversibly cycled and thus capable of switching between at least two different resistive states, in MaCollum's device in order to improve the characteristics and the operation of the device. The combination is motivated by the teachings of Ovshinsky et al. who point out the advantages of using a programmable resistive material comprises a chalcogenide material.

Regarding claims 2, 5, 9, 10, 12, 13, 14, 24, 27-28, 30-32, 58, 61, 63-65 and 70, the device of MaCollum and Ovshinsky et al. includes a programmable resistive material formulated to be reversibly cycled between at least two different resistive states,

wherein the chalcogenide material is selected from a group consisting of tellurium (Te), germanium (Ge), antimony (Sb), and combinations thereof,

wherein the second conductive layer 38 comprises titanium nitride or carbon,

a conductive barrier layer between said programmable resistive material and said second conductive layer,

Art Unit: 2811

a second conductive layer above the programmable resistive material and an interlayer dielectric over the second conductive layer, the interlayer dielectric including an aperture that exposes at least a portion of an upper surface of said second conductive layer, and

conductive grid interconnect within said aperture, wherein

said conductive grid interconnect is selected from the group consisting of titanium, titanium nitride and aluminum.

Regarding claims 6-7, 15-18, 25-26, 33-36, 59-60 and 66-69, MaCollum and Ovshinsky et al. do not teach the chalcogenide material includes tellurium (Te), germanium (Ge), and antimony (Sb) in a ratio of $Te_aGe_bSb_{100-(a+b)}$, where a, b, and $100-(a+b)$ are in atomic percentages which total 100% of the constituent elements and $a \leq 70$ and $15 \leq b \leq 50$, wherein $40 \leq a \leq 60$ and $17 \leq b \leq 44$, and a portion of said at least one protrusion comprises a frustoconical tip having a frustum lateral dimension of at least 0.1 and 0.4 microns and a height of approximately 2000Å.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a chalcogenide material includes tellurium (Te), germanium (Ge), and antimony (Sb) in a ratio of $Te_aGe_bSb_{100-(a+b)}$, where a, b, and $100-(a+b)$ are in atomic percentages which total 100% of the constituent elements and $a \leq 70$ and $15 \leq b \leq 50$, wherein $40 \leq a \leq 60$ and $17 \leq b \leq 44$, and a portion of said at least one protrusion comprises a frustoconical tip having a frustum lateral dimension of at least 0.1 and 0.4 microns and a height of approximately 2000Å in the device of MaCollum

Art Unit: 2811

and Ovshinsky et al., in order to optimize the characteristics of the device since it is within the skills of an artisan to improve the operation and characteristics of the device, subject to routine experimentation and optimization.

Regarding claim 21, MaCollum teaches in figure 1c and related text an integrated circuit device comprising:

a first electrode 12 having a first portion and a second portion, a width of the first electrode narrowing substantially and continuously in a direction extending from the second portion toward said first portion of the first electrode; a layer of programmable resistive material 16 in contact with said first portion of said first electrode; and a second electrode 28 coupled to the layer of programmable resistive material.

Regarding claim 56, MaCollum teaches in figure 1c and related text an integrated circuit device comprising:

a first conductive layer 12 on a substrate 10, wherein the first conductive layer includes at least one raised portion;

a programmable resistive material 16 in direct contact with said at least one raised portion of said first conductive layer, and

a second conductive layer 28 above said programmable resistive material.

Art Unit: 2811

Response to Arguments

Applicant's arguments with respect to claims 1-10, 12-18, 21-28, 30-37, 56-61 and 63-70 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Art Unit: 2811

Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2811 Fax Center number is (703) 308-7722 and 308-7724. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.

Any inquiry concerning this communication or any earlier communication from the Examiner should be directed to *Examiner Nadav* whose telephone number is **(571) 272-1660**. The Examiner is in the Office generally between the hours of 7 AM to 4 PM (Eastern Standard Time) Monday through Friday.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Technology Center Receptionists** whose telephone number is **308-0956**

A handwritten signature in black ink, appearing to read 'Ori Nadav', with a stylized flourish at the end.

O.N.
1/3/05

ORI NADAV
PRIMARY EXAMINER
TECHNOLOGY CENTER 2800